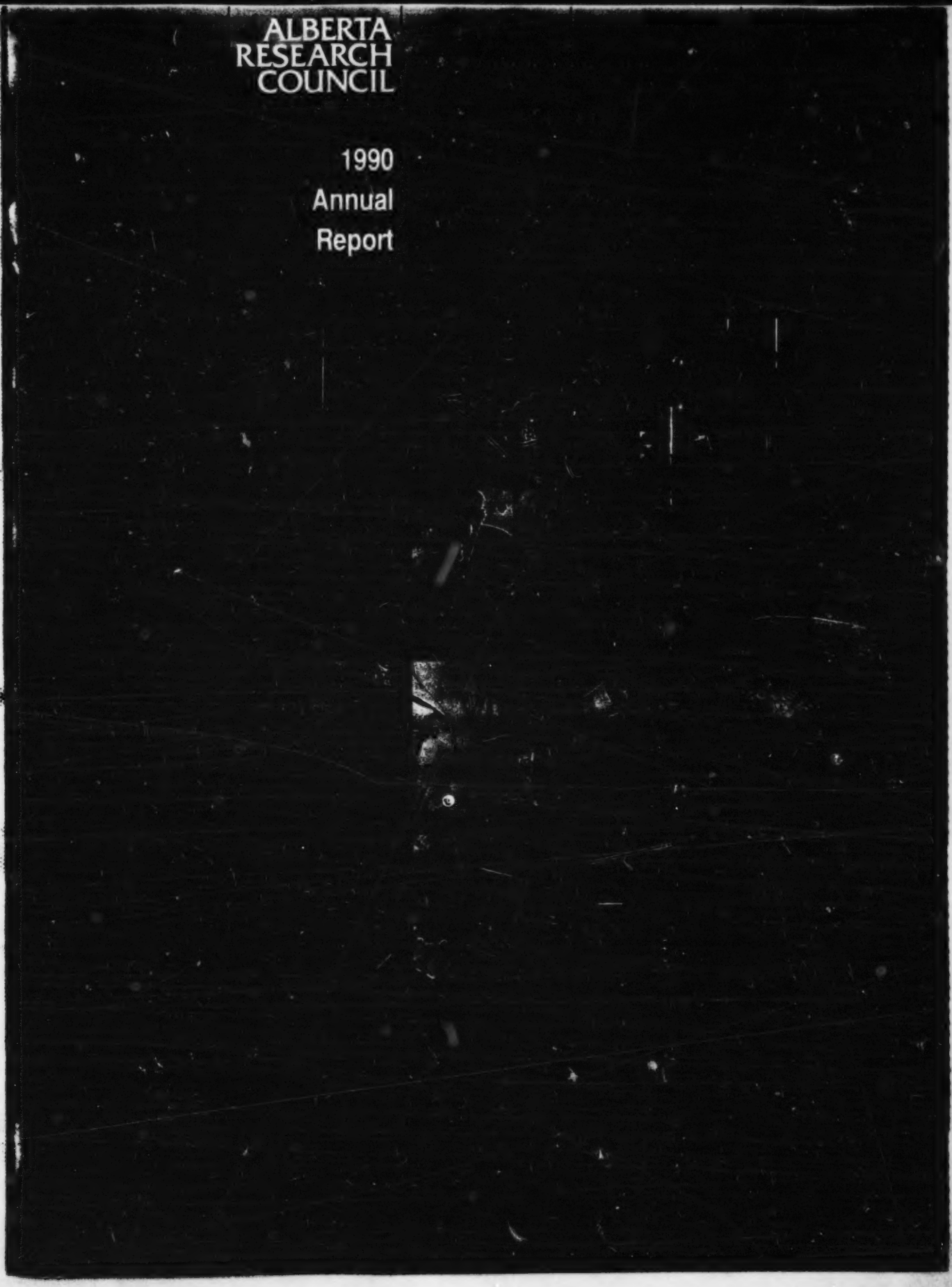
# ALBERTA RESEARCH COUNCIL

# 1990 Annual Report



# Mission Statement

Sessional Paper 125/91
1 Session, 22 Legislature

91-05009/

The mission of the Alberta Research Council is to advance the economy of the province by promoting technology development, performing applied research, and providing expert advice, technical information and scientific infrastructure that is responsive to the needs of the private sector and supports the activities of the public sector.

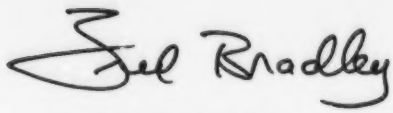
*Cover: Biotechnologists Janet Marowitch and Twyla Malcolm at the bioengineering test bed used for examining fermentor mixing patterns and shear stress.*

# Letter of Transmittal

To The Honorable Fred A. Stewart
Minister of Technology, Research & Telecommunications

In accordance with the requirements of the Alberta Research Council Act, I have the honor to present to you the Annual Report of the Alberta Research Council for the calendar year 1990.

Respectfully submitted,



Fred D. Bradley, M.L.A.
Chairman of the Board
Alberta Research Council

February 1991

# Corporate Profile

The Alberta Research Council is a crown corporation of the Province of Alberta, with 600 employees, offering a diversified range of scientific, engineering and technological research and testing capabilities in:

**Advanced Computing and Engineering:** Computer-based technologies including automation, expert systems and robotics for application and transfer to industry.

**Alberta Geological Survey:** Characterization of oil sands, coal, industrial and metallic minerals; hydrocarbon reservoir analysis and characterization; studies related to deep disposal of liquid wastes; metallic mineral core library.

**Biotechnology:** Microbiology; fermentation technology and scale up; bioprocess engineering; plant cell culture; biosafety; bioscience space research.

**Coal and Hydrocarbon Processing:** Hydrocarbon upgrading process research including heavy oil, bitumen, distillates, coal and natural gas. Projects in agglomeration, gasification, combustion, co-processing; hydrocarbon upgrading; classification and evaluation of Alberta coals by pyrolysis and petrography.

**Electronics Test Centre:** Testing and evaluation services for electronic and telecommunications products requiring product certification; assistance to companies planning and developing new products.

**Environmental Research and Engineering:** Environmental sensing and modelling; spatial information and data aquisition; land-related information systems (LRIS); civil engineering research in transportation and rivers; management of soil and groundwater resources; land reclamation for use after surface mining; industrial waste management; contaminant hydrogeology.

**Forestry:** Forest products development and testing of forest products using Alberta forest resources; application of technologies such as land-related information systems to the forestry sector.

**Manufacturing Technologies:** Research and development in advanced materials; waste management, recycling and utilization; materials testing; gasoline and oil, industrial chemicals and products testing, and analytical chemistry. Joint Research Venture Program: sharing resources with participating companies to help Alberta industries take innovative and marketable technology to commercial development. Industrial Technology Advisor Network (ITAN): short-term advisory and technical service to Alberta companies; delivery of the National Research Council's IRAP programs to Alberta industry.

**Oil Sands and Hydrocarbon Recovery:** Thermal heavy oil and enhanced recovery investigations; physical and numerical simulations; waxy crude studies; production and pipelining studies; technical and economic evaluation and modeling; maintenance of an oil sands sample bank.

*The Alberta Research Council is a member of the Association of Provincial Research Organizations (APRO).*

# Chairman's and President's Message

The challenges facing the Alberta Research Council are no longer contained within our local boundaries. If we are to continue to fully support Alberta's economic well-being, we must look at the issues in a global context, and develop strategies that will allow us to be players on a world scale. Economic competitiveness and rapid technological advances in a climate of growing environmental concern are the critical issues now facing us.

We have identified four key objectives encompassing a set of strategies and directions for the Research Council as it progresses through the next decade:

- Linking advanced technology and resource industries. Our goal is to enhance the interface between these two vital sectors of Alberta's economy. Our Resource Technologies Division integrates the technology needed for resource development, including inventory, development, and environmental impact activities. The Advanced Technologies Division encompasses the key strategic technology identified for Canadian emphasis, including computing and knowledge-based systems, biotechnology, advanced manufacturing and materials. Program links across these two divisions ensure effective application of advanced technology to resource industries, and offer optimum potential for new advanced technology companies.

- Leadership in sustainable development technology. Since its founding in 1921, the Alberta Research Council has been applying scientific and engineering expertise in the identification and management of our natural resources. We are committed to continuing that tradition, recognizing the value of our renewable and non-renewable resources. A new Environmental Research and Engineering Department addresses natural resource management concerns and environmental issues. One of its major programs – land-related information systems – is a key intitiative. Other departments are investigating environmental questions: Manufacturing Technologies is developing new programs in waste recycling and management; Coal and Hydrocarbon Processing has developed promising technology for cleaning contaminated soil; Oil Sands and Hydrocarbon Recovery is leading a consortium to study the complex properties of tailings sludge, an increasing concern of the oil sands industry.

- Expanding collaborative links with industry, government and academic institutions. The full benefit of our research and technology applications is achieved only when client industries have strengthened their position in the marketplace. We are continuing to enhance our ability in this regard through such avenues as the joint research venture program, contracts, fee-for-service testing, and in delivery of the National Research Council's Industrial Research Assistance Program in Alberta. While the Alberta Research Council has an impressive range of scientific and engineering expertise, we recognize that our resources can be considerably broadened by tapping into the intellectual and technological pool of universities and other research agencies. Collaborative agreements with such organizations as the National Research Council, the Alberta Environmental Centre, the Saskatchewan Research Council, the Canadian Energy Research Institute, the universities of Alberta and Calgary, and the Northern and Southern Alberta Institutes of Technology, provide a foundation for sharing research resources to assist industry.

- Providing a gateway to international technological opportunities. Technology does not recognize national boundaries; Canada and Alberta must have the greatest possible access to the world marketplace. The Alberta Research Council, with its ties to the international scientific community, acts as a 'door-opener' for the government and

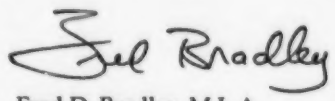
the private sector to counterparts across the country and abroad. We not only promote technology transfer to other countries, but we can provide access to foreign technology needed by Canadian industry. This year we established agreements with Eniricerche of ENI Group, Italy, and the Dansk Teknologisk Institut, Denmark.

We have a larger role to play in the decade ahead. Alberta industry, if it is to be an R&D player worldwide, will need our help more than ever. We must be one of the organizations that answers the call for increased R&D. Our Board of Directors has endorsed ARC 2000, a framework by which we can respond to this challenge.

ARC 2000 is an agressive model which casts the Alberta Research Council as an internationally recognized technology corporation, a valued and important partner in the emergence of a globally competitive Alberta. It means major new program initiatives, and having the people and facilities in place to act quickly when opportunities arise. We have already begun this process. We are proposing, for example, an energy industry environment program to address generic environmental issues; we want to expand our endeavour in waste management to include development of integrated waste handling and processing technologies; we are responding, with a broad spectrum of health care stakeholders, to recommendations in the Rainbow Report from the Premier's Commission on Future Health Care for Albertans.

And finally, a word about science awareness. It's just beginning to happen, but we must continue to raise the consciousness of the community at large, and encourage young people to consider science and technology careers. In addition to supporting science fairs and awarding scholarships, the Alberta Research Council sponsors a successful teachers' summer work experience program, and is considering other community-focused initiatives.

The development of capabilities is a continuous process and making room for new intiatives is a natural function of living and growing. It takes courage to try new ideas, but creativity is our most important capability. The mechanisms to permit the integration of these ideas, both for today and in the future, must be developed. We are not able to predict the future, but we must be ready for it and, through continuity and participation, we will determine our destiny.



Fred D. Bradley, M.L.A.
Chairman of the Board

Clem W. Bowman
President

## President's Postscript

In 1991 I conclude my term as president of a truly remarkable organization, one with a noble past and an exciting future. My contact with the Alberta Research Council began as a client in the 1960s and 1970s, continued as a Board member since 1979, and culminated as president for the last four years. It has been a privilege to have taken part in the evolution of an organization en route to its vision of ARC 2000.

Canada has always been a trading nation, and more than ever, globally competitive technology is a national imperative. The Alberta Research Council has positioned itself to contribute to that capability in a unique, catalytic role between industry, government and academia. To all my colleagues, my very best wishes for what will be a most exciting decade.

# The Year in Review

**Advanced Computing and Engineering** – In a contract for Alberta Transportation and Utilities, the Alberta Research Council developed a highway intersection design expert system (HIDES). HIDES is one of many possible artificial intelligence applications to civil engineering. It simplifies the highway intersection design process by providing expert guidance and graphic images of certain design aspects. HIDES is being implemented as a working system for universal design standards, resulting in significant cost benefits.

Geopig, a pipeline monitoring technology developed in a joint research venture with Pulsearch Consolidated Technology Ltd., is being marketed by Pigco, a Pulsearch subsidiary. The geopig is the only pig designed to monitor pipeline geometry. Pigco has completed contracts with two Canadian companies this year, and has contracts with two British oil and gas firms, and another with the Petroleum Authority of Thailand.

In a joint research venture with Applied Terravision Inc., Calgary, a research team designed and created a computer software system which uses stereo images from the French SPOT satellite, matches them to the correct geographic location, and then extracts the elevations from stereo images. Elevations are passed to a high power computer workstation which creates the 3-D digital elevation model images. As a result of this project, Applied Terravision is the first company to develop an interactive 3-D system which will benefit a number of industries; for example, hydro companies can better plan routes through mountainous areas.

The department is undertaking a project with the Centre for Frontier Engineering Research (C-FER), Edmonton, to develop a proof-of-concept prototype for intelligent monitoring and control of complex systems such as the mobile servicing system (MSS) of the U.S. Space Station. The project team is developing a related terrestrial application: a prototype intelligent system for stability monitoring and control of semi-submersible drilling or production platforms. The prototype will have commercial potential in the oil industry, and can be modified for other applications such as process plant monitoring.

**Alberta Geological Survey** – The Peace River Arch Project, a study of the geological setting, history and hydrology of the region extending across northwestern Alberta and into British Columbia, was completed in 1990. A more precise definition of the behavior of the Arch during the various stages of its evolution contributes valuable new information to the petroleum industry, which will benefit future exploration efforts in the area. The study was a cooperative project between the Alberta Geological Survey and the Institute of Sedimentary and Petroleum Geology (Geological Survey of Canada).

Technology transfer efforts related to coal bed methane are being fostered by a subscription-based initiative (Phase I), aimed at more clearly defining the coal bed methane potential of the Alberta basin. Phase I, mapping the distribution and thermal maturity of several coal zones in the plains and foothills, is supported by 14 companies, the Alberta Department of Energy and CANMET.

The Alberta Geological Survey, supported by the Alberta Oil Sands Technology and Research Authority (AOSTRA), has completed investigations into the north, central and southern portions of the vast Athabasca oil sands area. Resource characterization studies provide an assessment of the sedimentology, stratigraphy, resource distribution and mineralogy of key formations.

**Biotechnology** – The Biotechnology Department carried out fermentation scale-up and process development for the bacterial cellulose fibre Cellulon™ on behalf of Weyerhaeuser Company. Cellulon™ has numerous promising commercial uses as a binder, thickening agent, and in coating applications for the oil, paper and food industries. Work for Protein Polymers Technology Inc. to determine feasibility of commercial production via fermentation of silk-like synthetic polymers was conducted in 1990. Primary applications are intended for cosmetic industry products such as hair conditioner.

Significant improvements in yield for Biosys have led to increased competitiveness of the company's biological pesticide products for commercial manufacturing. As a result of this successful developmental work, Biosys has three products in U.S. markets. Scale-up and process development with Philom Bios Inc of Saskatoon, Saskatchewan, has continued on two products: PB-50 (a phosphate inoculant) and BioMal (a bioherbicide) for control of Round Leaf Mallow. PB-50 was launched this year and BioMal is expected to be on the market in 1991.

A number of new potential clients with scale-up and interim production requirements have approached the Alberta Research Council, and several contracts are under negotiation.

**Coal and Hydrocarbon Processing** – New initiatives in hydrogen research include projects in production, separation, storage and utilization. On behalf of the Hydrogen Industry Council, the Alberta Research Council has established a Canadian network to coordinate research related to the addition of hydrogen to fossil fuels. Research Council projects include investigations of ceramic membranes for high temperature separation of hydrogen from other gases, electrolysis of hydrogen sulfide, and model development leading to an understanding of hydrogen production/consumption networks. In addition to joint hydrogen projects with industry and government, the Research Council participates in the strategic planning and policy development for Alberta.

Industrial consortium work on agglomeration, a method which upgrades low quality coal and heavy oil, was successfully completed. Each of the three potential applications is being considered for commercialization. For example, the department is assisting Southern Company Services Inc., Alabama, in the design of a demonstration plant for pyritic sulphur rejection. Commercialization of the soil clean-up application is being pursued. Two Alberta companies are actively developing the low severity, low rank coal/heavy oil upgrading technologies.

The department works closely with the Alberta Office of Coal Research and Technology (AOCRT) in the areas of gasification, combustion, and coal-liquids analysis. This year's coal combustion studies led to a better understanding of the ash properties of Alberta coals. Investigation of the production of low cost liquid fuels from coprocessing of coal and bitumen is being carried out under contract to Canadian Energy Development Inc., funded in part by AOCRT and AOSTRA.

Under the AOSTRA/ARC Hydrocarbon Upgrading Program, the department conducted research into high conversion processes, mechanisms of coke formation and novel catalytic processes. Comprehensive hydrodynamic and kinetic models for a bitumen hydrocracking process were refined. Based on the preliminary data analysis of the pilot plant operation, there is good potential for further development of the AOSTRA/ARC high conversion upgrading process. Methods for the control and prevention of coke formation were successfully demonstrated in laboratory scale tests.

**Electronics Test Centre** – The Electronics Test Centre performed work on 326 projects for 97 clients in its three laboratories: Electromagnetic Compatibility, Product Integrity, and Terminal Attachment. This work included 168 projects for 34 Alberta companies representing 95 per cent of the Alberta testing market.

The Test Centre also received guidance from its newly formed Program Development Committee. Composed of senior executives from the four western provinces, this industry-led committee helps ensure that Test Centre programs remain relevant to the needs of the electronics industry.

A survey of 100 clients to determine service delivery satisfaction confirmed that most needs were being met, but also identified areas where improvement would bring even higher levels of client satisfaction. The questionnaire covered four key areas: service quality, responsiveness, staff attitude, and price, and the responses gave the Test Centre an overall rating of 4.2 out of a possible 5.

Attention to client satisfaction and industry needs was highlighted by significant growth in terminal attachment testing, particularly business from U.S. and Japanese laboratories. The Test Centre also carried out work for the Canadian Patrol Frigate, Low Level Defence System, North Warning System and CF-18 Fighter Aircraft programs.

**Forestry** – In the second year of a humane trapping program, three humane trapping systems have been developed by the Forestry Department's wildlife section: the EGG trap for raccoon, the Kania trap for marten and the Sauvageau 2001-8 trap for Arctic fox. The efficiency of the EGG trap is being tested in Quebec and British Columbia; the Kania trap in New Brunswick and the Northwest Territories, and the Sauvageau 2001-8 trap in the Northwest Territories. This work is funded by the Fur Institute of Canada, Alberta Forestry, Lands and Wildlife, Alberta Agriculture and the Alberta Research Council.

Researchers are working with the Fur Institute of Canada on habitat and ecological studies aimed at reintroducing the fisher to Western Canada and, in particular, to central Alberta. In an innovative program, 17 of these fur-bearers were fitted with radio collars and released in Elk Island National Park and adjacent sanctuaries from March to June 1990. Their activities are being monitored and it appears that fishers could thrive again in the Parklands of Alberta.

A cross certification agreement with Dansk Teknologisk Institut, Denmark, signed in 1990, forges a link to gain firsthand insight into changes in European codes and standards for 1992. The agreement is expected to ease access to approvals of certain Canadian produced structural wood products for use in Europe, and the approval of certain Danish and other European produced structural wood products for use in Canada.

Four Canadian and United States patents for innovative two and three-dimensional panel products were issued in 1990. The Forestry Department received the Canada/Alberta Forest Resource Development Agreement award for excellence in wood products research and development.

**Environmental Research and Engineering** – This department was formed in 1990 by amalgamation of the former Resource Technologies and Terrain Sciences Departments. Environmental Research and Engineering Department staff designed and implemented a major study for the characterization of drilling wastes from sumps throughout Alberta. The Reclamation Research Technical Advisory Committee (RRTAC) funded the study design and will support the data synthesis and final report preparation. Project data will enhance results of a three-year study completed by the Alberta Research Council, RRTAC and the Alberta Land Conservation and Reclamation Council, and will be used to support decisions made with respect to environmentally responsible disposal of drilling wastes.

The impact of large floods was evident throughout the province during 1990. These events provided an opportunity for staff to measure river scour at more than 20 structures on Alberta rivers. The data, collected in cooperation with Alberta Transportation and Utilities, will be used to develop criteria for the design and construction of river bank protection works.

Staff completed an annotated bibliographic database of recent literature on global warming, in cooperation with Alberta Energy, the Alberta Oil Sands Technology and Research Authority and Alberta Environment. The final report summarizes current knowledge and the degree to which scientific consensus exists on the science of global warming and climate change.

The value of geographic information systems (GIS) to planners and analysts was demonstrated in projects completed for Alberta Tourism, Alberta Culture, the Alberta Planning Board and the Alberta Hail and Crop Insurance Corporation. Data were collected from automated and manual systems, converted, correlated and combined into a single database with an easy to use graphical display tailored to user needs.

**Manufacturing Technologies** – This department, formerly Materials and Testing, has been expanded to encompass the Joint Research Venture Program and the Industrial Technology Advisor Network.

The new engineering services group, working with NovAtel Communications Ltd., completed design of a robotic workcell for the final assembly of cellular phones to be produced at the new Calgary plant.

The Alberta Waste Materials Exchange (AWME) assisted the Saskatchewan Research Council in the development of a waste exchange for Saskatchewan. This will be the beginning of a western Canadian network of waste exchanges. The AWME has informal links with other exchanges in North America through a network being set up by the U.S. Environmental Protection Agency. The AWME has been involved in the investigation of the use of waste plastics collected from the municipal waste collection system and the recycling of municipal solid wastes through various processes.

The services of the Joint Research Venture (JRV) program were recently expanded to include two new elements: support for projects in the $10,000 to $200,000 range; and the Product Development Assistance Program (PDAP) aligning facilities and expertise of the Alberta Research Council and the Southern Alberta Institute of Technology with those of Alberta industry. Under PDAP, financial support is provided to projects costing less than $10,000.

New JRV projects include a joint research venture with Canadian Flamecoat Systems of Calgary. This involves research in developing new chemically engineered polymers, innovative measurement of coating properties and testing of coating integrity. The developed technology will have immediate application in the chemical, petro-chemical, petroleum, pulp and paper industries.

The Industrial Technology Advisor Network assisted more than 2,800 companies over the past year. The Alberta Research Council, through a contribution agreement with the National Research Council, continues to deliver the federal Industrial Research Assistance Program (IRAP), which enables small to medium-size companies to perform in-house, research and development projects.

A joint program was initiated with the National Research Council on advanced materials, developing wear resistant coatings and ceramics which will be partially funded by industry.

**Oil Sands and Hydrocarbon Recovery** – Under a five-year AOSTRA/ARC/ Industry Research Program, a number of major technical accomplishments have resulted in pilot plant trials in the field. They include: steam-foam and steam-surfactant processes for enhanced recovery through improved conformance control, tested in Alberta reservoirs by AOSTRA and individual industrial members; steam-gas additive processes, which yield large economic gain through the addition of small amounts of $CO_2$ or other gases. Techniques for physical and numerical simulation of these advanced processes have been used in the design of the AOSTRA Underground Test Facility, Fort McMurray.

Laboratory testing, analytical services, engineering design services and operations personnel were provided to the OSLO (Other Six Leases Operation) consortium testing new processes for extraction of bitumen from mined oil sands.

A novel sand removal process using a cationic surfactant was developed and a patent proposal has been submitted.

The use of horizontal wells in shallow oil sands formations can result in significantly improved rates and total recovery of hydrocarbon. In a joint project, sponsored by Esso Resources Canada and CANMET, a scaled model study to determine optimum placing of horizontal wells in a formation was completed. Test results from the project will be used to assist in the operation of horizontal well combinations in AOSTRA's Underground Test Facility.

How to reduce the impact of pulp mill effluents was the subject of two studies with Millar Western Pulp Ltd. The use of micro dissolved air flotation (DAF) to reduce the solids content in pulp mill effluent, and the chemical treatment of evaporator distillate, associated with recycled water within zero-effluent pulp mills, were examined. Tests showed that, with this particular version of DAF technology, suspended solids could be reduced to a significantly low level in the effluent without the use of chemical additives, which other types of DAF units require.

The Alberta Research Council is under contract, through G.K. International, to supply research equipment to the Research Institute for Petroleum Exploration and Development (RIPED), Beijing. Two advanced phase behavior systems, developed by the Research Council for measurement of heavy oil-gas-water mixtures, have been fabricated and commissioned at the Oil Sands and Hydrocarbon Recovery Department with RIPED personnel. These systems have been shipped to China, where the equipment will be re-commissioned by visiting Research Council staff in RIPED laboratories.

# Auditor's Report

**To the Board of Directors of the Alberta Research Council**

I have examined the balance sheet of the Alberta Research Council as at March 31, 1990 and the statement of revenue, expenditure and equity for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Council as at March 31, 1990 and the results of its operations and the changes in its financial position for the year then ended in accordance with the disclosed basis of accounting, as described in Note 2 to the financial statements, applied on a basis consistent with that of the preceding year.

Donald D. Salmon

FCA
Auditor General

Edmonton, Alberta
June 29, 1990

Alberta Research Council

## Balance Sheet

as at March 31, 1990 (thousands of dollars)

| Assets | 1990 | 1989 |
|---|---|---|
| *Current:* | | |
| Cash | $ 3,345 | $ 8,024 |
| Accounts receivable | 6,231 | 4,134 |
| Accrued income receivable | 2,293 | 2,867 |
| Prepaid expenses | 304 | 350 |
| Advances to joint research ventures | 221 | 166 |
| Current portion - deferred pension costs (Note 3) | 73 | 73 |
| | 12,467 | 15,614 |
| *Non-current:* | | |
| Deferred pension costs (Note 3) | 219 | 291 |
| Investment in limited partnership (Note 4) | 200 | 200 |
| | 419 | 491 |
| *Fixed:* | | |
| Equipment (Note 5) | 55,919 | 52,351 |
| | 68,805 | 68,456 |
| *Trust Fund:* | | |
| Cash | 194 | 144 |
| | $68,999 | $68,600 |

| Liabilities and Equity | 1990 | 1989 |
|---|---|---|
| *Current:* | | |
| Accounts payable | $ 3,597 | $ 3,130 |
| Unearned contract revenue | 998 | 1,709 |
| Promissory note payable | – | 200 |
| | 4,595 | 5,039 |
| *Equity:* | | |
| Fixed assets (Note 6) | 55,919 | 52,351 |
| Operating | 4,551 | 4,384 |
| Special purpose, Schedule 1 | 3,740 | 6,682 |
| | 64,210 | 63,417 |
| | 68,805 | 68,456 |
| *Trust Fund:* | | |
| Liability | 194 | 144 |
| | $68,999 | $68,600 |

The accompanying notes are part of these financial statements.

Alberta Research Council

## Statement Of Revenue, Expenditure And Equity

for the year ended March 31, 1990 (thousands of dollars)

| | Operating | Special Purpose (Schedule 1) | Total 1990 | 1989 |
|---|---|---|---|---|
| ***Revenue*** | | | | |
| Grants from Province of Alberta: | | | | |
| General Revenue Fund | $21,350 | $ 3,100 | $24,450 | $23,500 |
| Contract revenue: | | | | |
| Provincial government departments and agencies | 10,003 | – | 10,003 | 9,854 |
| Other | 13,199 | – | 13,199 | 11,566 |
| | 44,552 | 3,100 | 47,652 | 44,920 |
| ***Expenditure*** | | | | |
| Salaries, wages and benefits | 29,221 | 236 | 29,457 | 25,651 |
| Supplies and services | 12,083 | 770 | 12,853 | 12,265 |
| Fixed assets | 3,606 | 1,241 | 4,847 | 5,196 |
| Joint research ventures | – | 3,270 | 3,270 | 1,875 |
| | 44,910 | 5,517 | 50,427 | 44,987 |
| Net expenditure for year | (358) | (2,417) | (2,775) | (67) |
| Transfer to operating equity | 525 | (525) | – | – |
| | 167 | (2,942) | (2,775) | (67) |
| Equity at beginning of year | 4,384 | 6,682 | 11,066 | 11,133 |
| Equity at end of year | $ 4,551 | $ 3,740 | $ 8,291 | $11,066 |

## Notes To The Financial Statements

March 31, 1990

*Note 1* ***Authority***

The Alberta Research Council operates under the authority of the Alberta Research Council Act, Chapter A-35.1, Statutes of Alberta 1981.

*Note 2* ***Summary of Significant Accounting Policies and Reporting Practices***

*(a) General*

These financial statements have been prepared in accordance with generally accepted accounting principles except that purchases of fixed assets are charged to operations in the year of acquisition. Notwithstanding the above, fixed assets are shown on the balance sheet at original cost, or at estimated cost, with the offsetting credit to fixed assets equity.

*(b) Advances to Joint Research Ventures*

Advances to joint research ventures are recorded as assets of the Council. The asset is reduced and a corresponding charge is made to expenditure for the Council's share of joint research venture expenses.

*(c) Patents*

Expenditures for patents owned by the Council as a result of research activity are not capitalized due to the uncertain value of benefits which may accrue to the Council.

*(d) Contract Revenue Recognition*

Contract revenue is recognized as costs are incurred, up to the contract maximum and in accordance with contracted cost-sharing ratios. The Council makes full provision for all known or estimated losses on uncompleted contracts as soon as they can reasonably be estimated.

*(e) Investment*

The Council is a minority shareholder in International Permeation Inc. The equity allocated to the Council was based on the technological "know how" acquired by International Permeation Inc. from a former company to which the Council provided research and technological expertise and was the majority shareholder.

The Council's equity in the company is not reflected in these financial statements due to the uncertain value of benefits which may accrue to the Council.

*(f) Special Purpose Equity*

Special purpose equity is to be used only for future expenditures related to those activities listed on Schedule 1.

*(g) Trust Liability*

Trust funds are contributions received from other government departments under research agency agreements which require the Council to administer the contributions and provide accounting services.

*(h) Changes in Financial Position*

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

***Note 3*** ***Deferred Pension Costs***

Total past service pension costs for employees joining the management pension plan prior to April 1, 1988 are being amortized on a straight-line basis over six years.

| | 1990 | 1989 |
|---|---|---|
| Balance at beginning of year | $291,386 | $344,427 |
| Net additions | – | 19,805 |
| | 291,386 | 364,232 |
| Less: Current portion | 72,846 | 72,846 |
| Balance at end of year | $218,540 | $291,386 |

Amortization of deferred past service costs amounted to $72,846. Past service costs in the amount of $82,974 for new members of the management plan in 1990 have been expensed in the year.

***Note 4*** ***Investment in Limited Partnership***

The Council has purchased one limited partnership unit comprising 10% in Spurt Investment Fund I, a venture capital fund designed solely to make equity investments in seed and early stage technology enterprises.

The investment is recorded under the cost basis of accounting.

| | 1990 | 1989 |
|---|---|---|
| Original cost | $300,000 | $300,000 |
| Less: Amount written off | 100,000 | 100,000 |
| Book value | $200,000 | $200,000 |

***Note 5*** ***Fixed Assets***

Fixed assets purchased subsequent to April 1, 1981 are valued at cost. Those purchased prior to April 1, 1981 by the Council are at estimated cost.

Included in fixed assets are certain fixed assets purchased as a result of research contracts which specify that the Council does not receive title to the fixed assets purchased until completion of the contract or at the discretion of the sponsor.

Fixed assets comprise:

| | 1990 | 1989 |
|---|---|---|
| Owned by the Council | $52,733,499 | $49,721,063 |
| Held by the Council on behalf of other government agencies and third parties | 2,868,153 | 2,312,810 |
| Owned by the Council and held by joint venture parties | 317,547 | 316,834 |
| | $55,919,199 | $52,350,707 |

*Note 6* ***Fixed Assets Equity***

| | | 1990 | 1989 |
|---|---|---|---|
| Balance at beginning of year | | $52,350,707 | $47,348,991 |
| Add: | Additions at cost | 5,001,374 | 4,504,542 |
| | Reduction of obligation under capital lease | – | 1,093,027 |
| | | 57,352,081 | 52,946,560 |
| Less: | Disposals at cost | 1,432,882 | 595,853 |
| Balance at end of year | | $55,919,199 | $52,350,707 |

*Note 7* ***Contingent Liabilities***

Statements of claim have been filed against the Council for approximately $500,000 by a former employee for wrongful dismissal. The outcome of this proceeding is not determinable at this time. Accordingly, the Council has not provided for this claim in the financial statements.

*Note 8* ***Obligations Under Operating Leases***

| | |
|---|---|
| Year ending March 31, 1991 | $333,632 |
| 1992 | 230,644 |
| 1993 | 145,314 |
| 1994 | 138,900 |
| 1995 | 107,804 |
| | $956,294 |

*Note 9* ***Unreflected Activities***

*(a) Occupancy and Office Furniture Expenditure*

The premises occupied by the Council and some office furniture have been provided by the Province of Alberta at no cost.

*(b) Interest Revenue*

Interest earned on the Council's Canadian dollar bank account is retained by the Province of Alberta.

*Note 10* ***Comparative Figures***

The 1989 figures have been reclassified where necessary to conform to 1990 presentation.

*Note 11* ***Approval of Financial Statements***

These financial statements were reviewed by management and recommended to the Board for approval.

Alberta Research Council

## Schedule of Special Purpose Revenue, Expenditure and Equity

**Schedule I**

for the year ended March 31, 1990 (thousands of dollars)

| | Electronics Test Centre | Joint Research Ventures Program | Mill Woods/ Devon Fitting Up | Electronics Industry Information Centre | Bio-technology Toll Facility | Total 1990 | Total 1989 |
|---|---|---|---|---|---|---|---|
| ***Revenue*** | | | | | | | |
| Grants from Province of Alberta: | | | | | | | |
| General Revenue Fund | $ – | $3,100 | $ – | $ – | $ – | $ 3,100 | $ 4,383 |
| Contract revenue | – | – | – | – | – | – | 525 |
| | – | 3,100 | – | – | – | 3,100 | 4,908 |
| ***Expenditure*** | | | | | | | |
| Salaries, wages and benefits | – | 223 | 13 | – | – | 236 | 1,064 |
| Supplies and services | – | – | 39 | – | 731 | 770 | 1,685 |
| Fixed assets | – | 15 | 218 | – | 1,008 | 1,241 | 923 |
| Joint research ventures | – | 3,270 | – | – | – | 3,270 | 1,875 |
| | – | 3,508 | 270 | – | 1,739 | 5,517 | 5,547 |
| Net expenditure for year | – | (408) | (270) | – | (1,739) | (2,417) | (639) |
| Transfer to operating equity | (291) | – | – | (234) | – | (525) | (72) |
| | (291) | (408) | (270) | (234) | (1,739) | (2,942) | (711) |
| Balance at beginning of year | 291 | 2,500 | 550 | 234 | 3,107 | 6,682 | 7,393 |
| Balance at end of year | $ – | $ 2,092 | $ 280 | $ – | $ 1,368 | $ 3,740 | $ 6,682 |

# Staff Recognition

The Alberta Research Council annually honors its employees for outstanding achievement and their names appear in this section. This group reflects not just the accomplishments of a few people, but rather the aspirations of the men and women throughout the organization to be the best at what they do. In presenting these awards, the board of directors and senior management expresses its appreciation for the dedication and hard work of all Alberta Research Council staff.

**Past Presidents' Award of Excellence:**

Dr. Eddy Isaacs (Professional)

Larry Holloway (Technical)

May Fallis (Support)

**Patents:**

Dr. Leszek Ignasiak, Dr. Wanda Pawlak, Dr. Jerzy Janiak, Al Turak: U.S. Patent, Method for Providing Improved Solid Fuels from Agglomerated Subbituminous Coal.

**Best Paper:**

Rod Ridley [K. Rafa, T. Tomoda]: Flow Loop and Field Testing of A Gamma Ray Compositional Meter. The paper was selected for the Eugene W. Jackson Best Paper Award.

**External Professional Awards:**

Greg Sidebottom: For the keynote address, Expert Systems for Environmental Management, at the 6th Annual Technical Conference on Chemical Spills, June 1989, Edmonton, Alberta.

Dr. Baki Ozum: For the Plenary Lecture, Overview of Coal Combustion Phenomena, May 1989, at the Spring Technical Meeting of Combustion Institute, Canadian Section, Toronto, Ontario.

Dzung Nguyen: Presented with the Ralph James Award of the Petroleum Division, American Society of Mechanical Engineers (ASME) for "outstanding contributions and service for the ASME Petroleum Division," January 1990, at the Energy-sources Technology Conference and Exhibition, New Orleans, Louisiana.

**Professional Recognition:**

Dixon Edwards: In recognition of his contribution to the field of education.

Elizabeth Page: For outstanding work in the preparation of DIRECTIONS, the organization's strategic plan for the 1990s.

**Long-term Service (25 years):**

Eugene Parranto

**Senior Level Promotions:**

Zdenek Widtman to
Research Technologist IV

Randall Hawkins to
Research Technologist IV

**Safety:**

Bernice Young

Gerry Pierce

**Team Effort:**

Presented to the Agglomeration Group of the Coal Upgrading and Utilization Section, Coal and Hydrocarbon Processing Department, for its "expertise and reputation in adaptation and refining of oil agglomeration technology to novel applications": Dr. Wanda Pawlak, Dr. Teresa Ignasiak, Asya Linetsky, Yevgenia Briker, Rose Filax, Rita Schultz, Sandra Stedman, Gord Heck, Al Turak, Leigh Falkenberg, Jim Kramer, Dr. Jerzy Janiak, Mike Malychuk, Dr. Kaz Szymocha, Dr. Leszek Ignasiak, Peter Mohammed, Angelo Iacchelli, Jim Marr, Warren Greig, Kent Ceaser, Dr. Richard Petela, Alnoor Thawer, Pat Aberle, Dennis Carson, Dan Rohatynski, Ed Taylor, Dr. Joe Ahmad, Keith Wourms.

# Board of Directors (January 31, 1991)

**Fred D. Bradley, M.L.A.[1]**

Chairman of the Board,
Alberta Research Council

**The Honorable Fred A. Stewart**

Minister, Technology, Research and Telecommunications

**Leonard F. Bolger[1,3]**

Executive in Residence, Faculty of Management, University of Calgary

**Dr. Robert B. Church**

Professor, Department of Medical Biochemistry/Biological Sciences, University of Calgary

**Dr. Renee E. Elio**

Assistant Professor, Department of Computing Science, University of Alberta

**Ray F. Fortune[3]**

President, Alberta Telecommunications Research Centre, Edmonton

**Dr. C. Robert James[1]**

Vice-President (Research),
University of Alberta

**Dr. Richard K. Kerr[4]**

Manager, Technical Services,
Alberta Energy Company Ltd., Calgary

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Executive Vice-President,
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Vice-President (Academic),
University of Lethbridge

**Dr. Edward (Ted) Rhodes[2]**

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University of Calgary

**Dr. Irene Teitz**

Microbiologist (ret.), Calgary

**Dr. Howard E. Tennant[3]**

President, University of Lethbridge

**Dr. Michael A. Ward[4]**

Vice-President (Research),
University of Calgary

**Dr. D. Robert Weir[1]**

Vice-President (Technology), Sherritt Gordon Ltd., Fort Saskatchewan

**Dr. Clem W. Bowman[1]**

President, Alberta Research Council

[1]Executive Committee member
[2]Appointed November 1990
[3]Appointed January 1991
[4]Retired from the Board 1990

# Alberta Research Council Staff*

## President's Office

**President:**
C.W. Bowman — Ph.D.(Toronto)

**Assistant to the President:**
T.V. Kureluk

### Corporate Communications

**Corporate Secretary and Director:**
D.M. Hollands

**Professional Staff:**

| | |
|---|---|
| L. Black | M.A.(Victoria) |
| L.D. Bradley | Topographic Draft (NAIT) |
| C.L. Forster | B.Sc.(Alberta) |
| R.D. Hite | B.Sc.(Alberta) |
| E.W. Page | B.A.(Dalhousie) |
| E.E. Spalding | M.A.(Edinburgh) |
| S. Stadler | |
| H.L. Zwickel | B.Sc.(Alberta) |

**Technical Staff:**

| | |
|---|---|
| J. Dlask | Agriculture (Czechoslovakia) |
| D.C. Magee | Cartographic Tech (Algonquin) |
| J.K. Matthie | Cartographic Tech (Algonquin) |
| K.E. Parrish-Hite | |
| M. Protz | B.A.A.(Ryerson) |

**Support Staff:**
S.D. Grolway
M.L. Limoges
L.D. Miller — Sec/Office Admin (NAIT)
V.M. Ross-Smith
C. Sampson
M. Schmidtke
C.L. Sieben
A.I. Williams

### Development and Planning

**Vice President:**
B.L. Barge — Ph.D.(McGill)

**Assistant to the V.P.:**

| | |
|---|---|
| D.J. Ford | Sr Sec(Ursuline) |
| D.L. Jackson | Med Sec(Grant MacEwan) |

**Professional Staff:**

| | |
|---|---|
| J.A. Boon | Ph.D.(Utrecht/ Manchester) |
| D.J. Currie | Ph.D.(Leeds) |

## Advanced Technologies

**Vice President:**
D.J. Cox — Ph.D.(Leeds)

**Assistant to the V.P.:**
L.Y. Boyer

**Professional Staff:**
J.M. Beddoes — B.Sc.(London)

**Research Fellow (Lipid Biology):**
T. Kaneda — D.Sc.(Tokyo)

**Visiting Scientists:**

| | |
|---|---|
| T. Kuriki | Ph.D.(Osaka) |
| S. Oka | Ph.D.(Hokkaido) |
| G. Wang | B.Sc.(Nankai) |

**Technical Staff:**
A.S. Green — Food Tech(NAIT)

### Advanced Computing & Engineering

**Head:**
E.J.H. Chang — M.D.(British Columbia) Ph.D.(Toronto)

**Visiting Scientist:**
J. Mulder

**Professional Staff:**

| | |
|---|---|
| K.O.M. Andrews | M.Sc.(Calgary) |
| M.A. Ariano | M.Math(Waterloo) |
| M.D. Brinsmead | M.Sc.(Calgary) |
| D.C. Brockelbank | M.Sc.(Saskatchewan) |
| K.G. Chrystall | M.Sc.(Stanford) |
| A. Dagnino | Ph.D.(Waterloo) |
| J.M. Driver | B.Sc.(Victoria) |
| S. Dubs | B.Sc.(Waterloo) |
| P.J. Feighan | B.Sc.(Calgary) |
| K.I. Gamble | M.Sc.(Victoria) |
| M.L. Jones | Ph.D.(Toronto) |
| V.L. Lau | M.Sc.(Alberta) |
| B.M. Liblong | M.Sc.(Calgary) |
| R. Loo | M.Math(Waterloo) |
| C.C. Lumb | B.Sc.(Waterloo) |
| C.A. MacKay | B.Sc.(Calgary) |
| D.P. Mason | B.Sc.(Calgary) |
| R.W. Masrani | M.Sc.(Calgary) |
| J.R. McCracken | M.Sc.(Calgary) |
| S.A. McIlraith | M.Math(Waterloo) |
| M. Mendoza | M.Sc.(Calgary) |
| G.R. Nevison | B.A.(Royal Military College) |
| G.R. Parks | |
| B.J. Schack | B.Sc.(Calgary) |
| G.A. Sidebottom | B.Sc.(Calgary) |
| L.A. Sutherland | B.Sc.(Queen's) |
| Y.W. Tam | M.Sc.(Alberta) |
| I.S.L. Tan | M.Sc.(Calgary) |
| J.B. Tubman | M.Math(Waterloo) |
| J.A. White | B.Sc.(Saskatchewan) |
| P.J. Wojcik | Ph.D.(Gdansk) |

**Support Staff:**

| | |
|---|---|
| K.L. Cheng | |
| A.V. Merling | B.A.(Calgary) |
| P.H. Rokeby | B.A.(Calgary) |
| R.M. Wilken | |

### Biotechnology

**Head:**
B.G. Thompson — Ph.D.(Western Ontario)

**Professional Staff:**

| | |
|---|---|
| J.A. Boothby | Bus Admin(NAIT) |
| J.M. Curtis | B.Sc.(Manitoba) |
| A. Jones | Ph.D.(Liverpool) |
| E.J. Keshavarz | Ph.D.(British Columbia) |
| W.T. Leps | Ph.D.(Wisconsin) |
| G. Macaloney | M.Sc.(London) |
| J.M. Marowitch | M.Sc.(Alberta) |
| F.J. Merchant | Ph.D.(Western Ontario) |
| R. Merchant | M.E.Sc.(Western Ontario) |
| P. Nagarajan | Ph.D.(Kansas State) |
| D.B. Ward | Ph.D.(Cornell) |

**Technical Staff:**

| | |
|---|---|
| J.M. Bilodeau | Bio Sci(NAIT) |
| M.A. Brandingen | Bio Sci(NAIT) |
| A.W. Chan | B.Sc.(Alberta) |
| D.C. Cuevas | B.Sc.(Manila) |
| R. De Vera | B.Sc.(Manila) |
| R.J. Del Valle | B.Sc.(Mapua) |
| I. Draper | Ind Food Tech(NAIT) |
| L.T. Duncan | B.Sc.(Alberta) |
| B.J. Fee | Bio Sci(NAIT) |
| P.F. Fung | Civil Eng(Thunder Bay) |
| P. Grey | B.Sc.(Alberta) |
| L.R. Laszchuk | Bio Sci(NAIT) |
| J.M. MacTaggart | B.Sc.(Regina) |
| T.Y. Malcolm | Chem Tech(NAIT) |
| M. Markle | Power Eng(NAIT) |
| M.T. Matlock | Bio Sci(NAIT) |
| L.C. O'Carroll | B.Sc.(Cork) |
| J.C. Ouellette | Bio Sci(NAIT) |
| J. Schwanke | Bio Sci(NAIT) |
| R.L. Silliphant | Bio Sci(NAIT) |
| D.M. Wilson | Bio Sci(NAIT) |
| L.D. Witte | Bio Sci(NAIT) |
| J.F. Yu | Chem Tech(NAIT) |

**Support Staff:**
K.T. Heiner
V.E. Phillips
L.I.V. Siever

* December 1, 1990

## Electronics Test Centre

**General Manager:**

| | |
|---|---|
| B.G. Young | HNC Telecom(London) |

**Professional Staff:**

| | |
|---|---|
| M.C. Frank | B.Sc.(Alberta) |
| W.K. Hoffart | B.Sc.(Saskatchewan) |
| D.J. Kisilevich | B.Sc.(Alberta) |
| R.A. Koller | B.Sc.(Alberta) |
| J.K. Newton | M.A.Sc.(Toronto) |
| C.R. Talliss | |

**Technical Staff:**

| | |
|---|---|
| B.D. Bodley | Elect Eng Tech (Algonquin) |
| D.M. Friesen | Elect Eng Tech(NAIT) |
| R.J. Growcock | Elect Eng Tech(Ryerson) |
| V.A. McLean | Mech Eng Tech (Conestoga) |
| M.A. Scarpino | Elect Eng Tech (New Caledonia) |

**Support Staff:**

| | |
|---|---|
| L.J. Hilts | |
| T.K. Novack | |
| L.F. Pregoda | C.I.M.(Alberta) |

## Manufacturing Technologies

**Head:**

| | |
|---|---|
| T. Heidrick | Ph.D.(Manitoba) |

**Professional Staff:**

| | |
|---|---|
| P. Basnak | B.Sc.(Manitoba) |
| K.D. Beliveau | B.A.(Alberta) |
| L.V. Beres | M.Sc.(Bratislava) |
| E.F. Bertram | Ph.D.(Illinois) |
| W. Cool | M.Sc.(Delft) |
| P. Crawford | B.Sc.(Calgary) |
| N. Cyr | Ph.D.(British Columbia) |
| J. Desrosiers | B.Sc.(Quebec) |
| A.G. Dickson | M.Eng.(McGill) |
| R.W. Faulder | B.Sc.(Alberta) |
| D. Ghosh | Ph.D.(McMaster) |
| J.M. Gray | Ph.D.(Colorado) |
| R.B. Heimann | Ph.D.(Berlin) |
| S.A. Holden | B.Sc.(Leicester) |
| W.C. Kay | B.Sc.(Alberta) |
| B. Kendal | B.Sc.(Alberta) |
| V.M. King | Bus Mgmt(NAIT) |
| D. Lamy | M.Sc.(Quebec) |
| L.A. MacDonald | B.Sc.(Calgary) |
| G.R. Manson | B.Sc.(Queen's) |
| S.C. Morgan | B.Sc.(Kingston) |
| A. Opel | B.A.(Wales) |
| C.Y. Pan | Ph.D.(Toronto) |
| E.H. Polukoshko | B.Sc.(Alberta) |
| B.K. Rebus | B.Sc.(Alberta) |
| J.H. Renick | M.Sc.(McGill) |
| D.B. Rosychuk | B.Sc.(Alberta) |
| G.W. Thorpe | B.Sc.(Saskatchewan) |
| R.W. Tower | M.Sc.(Moncton) |
| R.W. Wasel | B.Sc.(Alberta) |
| J. Watson | B.Sc.(Alberta) |

**Technical Staff:**

| | |
|---|---|
| S.G. Armstrong | Chem Tech(NAIT) |
| G. Berlingo | Welder(NAIT) |
| D.R. Bessette | Plastics Tech(NAIT) |
| V.N. Celino | Machinist(NAIT) |
| M. Danysh | Machinist(NAIT) |
| A.M. Desrosiers | Library Tech(Grant MacEwan) |
| A.R. Ewanchuk | Machinist(NAIT) |
| D.J. Fleming | Chem Tech(NAIT) |
| C.M. Goulet | Chem Tech(NAIT) |
| E.M. Hadfield | |
| L.A. Hermanutz | Chem Tech(NAIT) |
| S.W. Hollemeyer | Machinist(NAIT) |
| B.W. Hunt | Machinist(Essex) |
| T.W. Jacula | Chem Tech(NAIT) |
| T.D. Kosik | Chem Tech(NAIT) |
| J.K. Laidler | Chem Tech(NAIT) |
| P. Li | Plastics Eng(NAIT) |
| C.W. McMinis | Mech Ind Eng(NAIT) |
| J.A. Melnichuk | Chem Tech(NAIT) |
| J.R. Nelson | Chem Tech(SAIT) |
| R.D. Rau | Plastics Tech(NAIT) |
| M.D. Rawluk | Chem Tech(NAIT) |
| R.J. Salyzyn | Chem Tech(NAIT) |
| T.N. Sopkow | Mat Eng Tech(NAIT) |
| W.K. Wade | B.Sc.(Alberta) |
| D.D. Wascherol | Mat Eng Tech(NAIT) |
| D.M. Wauters | Library Arts(SAIT) |
| W.R. Winters | Plastics Tech(NAIT) |
| D.A. Wispinski | Chem Tech(NAIT) |
| E.V. Zacharuk | Chem Tech(NAIT) |

**Support Staff:**

| | |
|---|---|
| G. Boychuk | |
| A.C. Bull | |
| H.N. Dale | |
| B.L. Edwards | |
| B.J. Greenwood | |
| J.A. Griffiths | |
| A.M. Lippolt | |
| M. Marcano | |
| G. Paquette | |
| M.J. Swanek | |
| H.E. Tupper | |
| P. Yule-Charles | |

# Resource Technologies

**Vice President:**

| | |
|---|---|
| R.J. Fessenden | Ph.D.(McGill) |

**Assistant to the V.P.:**

| | |
|---|---|
| J.C. Checholik | |

## Coal and Hydrocarbon Processing

**Head:**

| | |
|---|---|
| A.H. Hardin | Ph.D.(British Columbia) |

**Research Officer - Emeritus:**

| | |
|---|---|
| K. Schulz | Ph.D.(Zagreb) |

**Visiting Scientists:**

| | |
|---|---|
| R.M. Elofson | Ph.D.(Wisconsin) |
| B. Zhou | Ph.D.(Louvain) |

**Professional Staff:**

| | |
|---|---|
| J.G. Badry | B.Sc.(Alberta) |
| Y. Briker | M.Sc.(Leningrad) |
| S.K. Chakrabartty | Ph.D.(Pittsburgh) |
| A.K. Chambers | M.Sc.(Waterloo) |
| D.T. Fong | B.Sc.(Alberta) |
| T. Gentzis | Ph.D.(Newcastle) |
| R.J. Germain | M.Sc.(Waterloo) |
| W.J. Grochowski | M.Sc.(Warsaw) |
| A. Iacchelli | M.Sc.(Rome) |
| B.L. Ignasiak | D.Sc.Ph.D.(Poznan) |
| T. Ignasiak | Ph.D.(Poznan) |
| J. Janiak | D.Sc.Ph.D.(Poznan) |
| G. Kovacik | M.Sc.(Alberta) |
| M.J. Kramer | B.Sc.(Alberta) |
| L.K. Lee | Ph.D.(New Brunswick) |
| L. Lewkowicz | M.Sc.(Warsaw) |
| R.K. Lott | M.Sc.(Queen's) |
| R.A. McFarlane | Ph.D.(Ottawa) |
| G.A. Morrison | B.Sc.(Alberta) |
| T. Ohuchi | M.Sc.(New Brunswick) |
| B. Ozum | Ph.D.(Virginia) |
| R.J. Parker | M.Sc.(Alberta) |
| W. Pawlak | Ph.D.(Poznan) |
| R. Petela | D.Sc.Ph.D.(Silesia) |
| S. Petrovic | Ph.D.(Dresden) |
| H.A. Rangwala | Ph.D.(Bombay) |
| M. Rashid | Ph.D.(Strathclyde) |
| A.R. Sanger | D.Phil.(Sussex) |
| M. Selucky | Ph.D.(Masaryk) |
| P.L. Simpson | Ph.D.(Durham) |
| K.J. Smith | Ph.D.(McMaster) |
| S.G. Stedman | |
| K. Szymocha | Ph.D.(Wroclaw) |
| A.A. Turak | M.Sc.(Alberta) |
| D.C. Wood | B.Ed.(Alberta) |
| D.M. Woycenko | B.Sc.(Alberta) |

**Technical Staff:**

| | |
|---|---|
| P.I. Aberle | Chem Tech(NAIT) |
| K.R. Badree | Chem Tech(NAIT) |
| G.A. Beaulieu | B.Sc.(Alberta) |
| M.H. Carmichael | B.Sc.(Alberta) |
| D.W. Carson | B.Sc.(Alberta) |
| K. Ceaser | |
| B.C. Croy | Chem Tech(NAIT) |
| B.E. Doherty | |
| R. Estigoy | Chem Tech(NAIT) |
| E. Evason | C.E.T.(SAIT) |
| L.J. Falkenberg | |
| Z. Frakman | M.Sc.(Rostov) |
| W.R. Greig | Chem Tech(SAIT) |
| R.W. Hawkins | B.Sc.(Alberta) |
| G.L. Heck | Hydrocarbon Eng(NAIT) |
| L.E. Johanson | Chem Tech(NAIT) |
| H.O. Kretschmer | R.E.T.(NAIT) |
| K.K. Lali | B.Sc.(London) |
| A. Linetsky | B.Sc.(Lvov) |
| H.L. Logan | Chem Tech (Centennial College) |
| P. Maillet | Ind Inst Tech (New Brunswick) |
| T.O. Manske | Chem Tech(NAIT) |
| J.F. Massey | |
| J.J. Mendiuk | C.E.T.(NAIT) |
| P.T. Mohammed | B.Sc.(Alberta) |
| C.C. Murray | |
| T.M. Painter | Chemistry(Reading) |
| A.P. Pipke | Petro Eng(NAIT) |
| D.W. Rohatynski | |
| M.M. Schurek | Chem Res Tech(NAIT) |
| J.E. Taylor | Chem Tech(NAIT) |
| C. Thompson | Chem Tech(NAIT) |
| N.A. Truong | Chem Tech(NAIT) |
| D.E. Ungarian | Chem Tech(NAIT) |
| J.S. Wilson | Instrumentation(NAIT) |
| R.W. Zacharkiw | Chem Tech(NAIT) |

**Support Staff:**

D.R. Clark
R.F. Filax
J.E. Moir
E. Robinson
I.M. Scabar
R.J. Schultz
M.A. Sorochan
T. Williams

## Environmental Research & Engineering

**Head:**

| | |
|---|---|
| S.R. Moran | Ph.D.(Illinois) |

**Professional Staff:**

| | |
|---|---|
| S. Abboud | Ph.D.(Guelph) |
| D.D. Andres | M.Sc.(Alberta) |
| L.D. Andriashek | M.Sc.(Alberta) |
| V.K. Arora | M.Sc.(Alberta) |
| F.D. Barlow | M.Sc.(McMaster) |
| D.B. Cheel | B.Sc.(Trent) |
| L. Cheng | Ph.D.(Toronto) |
| J.T. Christison | Ph.D.(Alberta) |
| M. English | Ph.D.(McGill) |
| M.M. Fenton | Ph.D.(Western Ontario) |
| C.J. Gibson | Ph.D.(McMaster) |
| R.W. Howitt | M.Sc.(Alberta) |
| H.R. Hudson | Ph.D.(Alberta) |
| M.R. Johnson | B.Sc.(Alberta) |
| B. Kochtubajda | M.Sc.(Alberta) |
| I.V. Krumins | M.Sc.(Calgary) |
| R. Krzanowski | M.Sc.(McGill) |
| M.G. Lier | M.Sc.(Saskatchewan) |
| R.A. MacMillan | M.Sc.(Alberta) |
| T.M. Macyk | M...(Alberta) |
| R.L. Morris | |
| W.L. Nikiforuk | B.Sc.(Alberta) |
| C.L. Palylyk | M.Sc.(Alberta) |
| C.F. Richmond | B.A. (California State) |
| M. Stanley-Jones | M.Sc.(Carleton) |
| R. Stein | M.Sc.(Alberta) |
| D. Thomson | B.Sc.(Kingston) |
| K. Tremaine | B.Sc.(Manitoba) |
| M.R. Trudell | M.Sc.(Waterloo) |
| L.W. Turchenek | Ph.D.(Adelaide) |
| H. Turner | Sec Arts(Humber College) |
| P.G. Van Der Vinne | M.Sc.(Alberta) |
| I. Whitson | B.Sc.(Alberta) |
| L. Wojtiw | Ph.D.(Alberta) |
| R.K. Wong | Ph.D.(Alberta) |
| R. Xie | Ph.D.(McGill) |

**Technical Staff:**

| | |
|---|---|
| S.D. Andrews-Smith | |
| J.M. Beres | B.P.E.(Alberta) |
| F. Bergwall | |
| R.J. Bilyk | Civil Eng Tech(NAIT) |
| G.C. Cardinal | Elect Tech(NAIT) |
| L.M. Chase | |
| K. Croft | Elect Tech(NAIT) |
| R.L. Faught | Chem Tech(NAIT) |
| K. Hinz | Chem Tech(NAIT) |
| M.H.R. Huemmert | Land Reclamation (Vermilion) |
| G.M. Jean | Earth Resources(NAIT) |
| J.A. Kinasewich | Elect Tech(NAIT) |
| A. Krol | |
| J. Lutz | |
| P. Mostert | Water Sci Tech(Kelsey) |
| F.I. Nikiforuk | B.Sc.(Alberta) |
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| M.E. Pigot | M.Sc.(McGill) |
| D.W. Reid | Earth Resources(NAIT) |
| W. Sadoway | R.E.T.(Alberta) |
| B.J. Sawyer | Agronomy(Olds College) |
| A. Schwarzer | Chem Tech(Dusseldorf) |
| D.G. Sjostrom | Mining(British Columbia) |
| J.H. Thompson | Water Sci Tech(Kelsey) |
| B. Trevor | Water Sci Tech(Kelsey) |
| Z. Widtman | Agriculture (Czechoslovakia) |

**Support Staff:**

A.E. Ellendt
K. Gates
L.I. Sheppard
M. Tatchyn

## Forestry Research

**Head:**

| | |
|---|---|
| P.C. Williams | M.Sc.(Aston) |

**Visiting Scientists:**

R. Cheng
M. Micko

**Professional Staff:**

| | |
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| L. Bach | Ph.D.(Syracuse) |
| L.E. Cardwell | |
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| S. Kirincic | B.A.Sc.(British Columbia) |
| G. Proulx | Ph.D.(Guelph) |
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**Technical Staff:**

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| D. Bilyk | |
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| D.G. Coolidge | |
| R.K. Drescher | Renewable Res Mgmt (Lethbridge) |
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K.R. Schiele

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**Research Officer - Emeritus:**

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| C. Singh | Ph.D.(Alberta) |

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| | |
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## Oil Sands and Hydrocarbon Recovery

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| | |
|---|---|
| M.P. duPlessis | Ph.D.(Alberta) |

**Visiting Scientists:**

| | |
|---|---|
| H. Bianchi | |
| B. Han | |
| H. Huang | |
| D.Y. Peng | |

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| | |
|---|---|
| R.F. Alex | Ph.D.(Simon Fraser) |
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| B.J. Fuhr | Ph.D.(Alberta) |
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| M.K. Green | M.Sc.(Alberta) |
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| G.J. Whitehead | B.Sc.(British Columbia) |
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| Y. Xu | Ph.D.(Alberta) |
| Z. Zhou | Ph.D.(Western Ontario) |

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| M.J. Danysh | Mat Tech(NAIT) |
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| K.R. Forshner | Aviation Tech(Ontario) |
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| C.L. Harris | |
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| W.E. Jossy | Chem Tech(NAIT) |
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| G.A. Kissel | |
| L. Klein | Chem Tech(NAIT) |
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## Operations

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| | |
|---|---|
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**Assistant to the V.P.:**

| | |
|---|---|
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| | |
|---|---|
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| J.F. Schutz | Audio Visual Comm (Grant MacEwan) |

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| L.G. Spinks | Library Tech(Grant MacEwan) |
| J. Sundby | Library Tech(Grant MacEwan) |
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| M.E. Weeks | |

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| S. Dooley | |
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| E.M. Shulz | B.Comm.(Alberta) |
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| **Support Staff:** | |
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| A. Bardai | B.Sc.(Calgary) |
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| W. Korendyk | B.Sc.(Alberta) |
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| L.R. White | B.Sc.(Alberta) |
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| B.M. Nowakowsky | B.Sc.(Alberta) |
| R. Penno | Telecom Eng(NAIT) |
| D.G. Saranchuk | Eng Design & Drafting(NAIT) |
| K.A. Wallewein | |
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| S. Thomson | |

## Occupational Health, Safety & Hygiene

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| J.A. Koehler | R.N.(St. Catharines) |
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| P. Palsson | C.H.N.C(Alberta) |
| **Technical Staff:** | |
| H.W. Dalpe | |
| D.S. Murray | |
| **Support Staff:** | |
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